MASTER

Computer Science and Engineering (CSE)

TU/e

**EINDHOVEN
UNIVERSITY OF
TECHNOLOGY**

TUE.NL

Software systems play an often unseen yet highly important role in our society. Consider, for example, the systems of banks or insurance companies, or the software in a television set, internet search engines or software that controls the electricity network. We cannot manage without them.

As a graduate of the Computer Science and Engineering master program, you will have a broad view of Computer Science and its applications. You will be able to algorithmically solve computational problems and reason about system behaviour. You will be able to model, design, analyse and implement software systems, and be able to make qualitative and quantitative judgements regarding the extent to which these systems meet their functional and non-functional requirements.

The CSE curriculum is structured in three **focus areas**, which are described below. These focus areas ensure a comprehensive and broad set of courses and provide guidance for the directions in which to specialize.

Program structure	Total ≥ 120 EC
Foundational courses*	15 EC
Specialization	15 EC
CSE electives*	30 EC
Free electives*	15 EC
Seminar	5 EC
Graduation project**	10+30 EC

* One course per focus area
** Three courses from the same focus area, in addition to a foundational course.
*** CSE Electives are courses from the focus areas or from a special list of electives and may also include a 15 EC internship; free electives can be courses from other programs or universities and homologation courses.
**** The graduation project consists of a preparation phase (10 EC) and a Master's Thesis project (30 EC).

ALGORITHMS & THEORY

A deep mathematical understanding of computation and semantics is indispensable for reasoning about the quality and efficiency of algorithms, data structures and (concurrent) systems. This focus area thus encompasses, for example, improving and understanding trade-offs between algorithm efficiency and quality, exploring and pushing the limits of computation, modelling and (manually, mechanically or fully automatically) verifying computational and/or concurrent systems.

Quarter	Code	Course
Foundational courses		
1	2IMA10	Advanced Algorithms
1	2IMF25	Automated Reasoning
4	2IMF10	Process Algebra
Deepening courses		
2	2IMA15	Geometric Algorithms
2	2IMA35	Massively Parallel Algorithms
3	2IMA20	Algorithms for Geovizualisation
3	2IMA25	Exact Algorithms for NP-hard Problems
3	2IMF15	Proving with computer assistance
4	2IMA30	Topological Data Analysis

ARCHITECTURE & SYSTEMS

Modern digital systems involve complex interactions between various hardware and software components operating under functional and non-functional requirements. This focus area addresses the understanding and management of the architecture, interactions, behavior, and trade-offs in such systems. In particular, it focuses on the theory and practice for the modeling, design, implementation, analysis and verification of complex networked, embedded, large-scale and data-intensive systems.

Quarter	Code	Course
Foundational courses		
1	2IMN10	Architecture of Distributed Systems
1	2IMF30	System Validation
2	2IMD10	Engineering of data systems
Deepening courses		
2	2IMN15	Internet of Things
2	2IMN20	Real-time systems
2	2IMF35	Algorithms for model checking
3	2IMN25	Quantitative evaluation of ES

SOFTWARE & ANALYTICS

Software is a key enabler in Computer Science. The development of software should be efficient and result in high-quality software. This focus area addresses the development of high-quality software in an efficient way. It does so by providing knowledge on developing correct software by construction and by combining principles and methodology of software development with analysis of information sources, specifically by mining software repositories to understand the effects of software evolution.

Quarter	Code	Course
Foundational courses		
1	2AMI10	Foundations of Process Mining
2	2IMP10	Program Verification Techniques
3	2IMP25	Software Evolution
Deepening courses		
1	2AMM20	Research Topics in Data Mining
2	2IMP40	Empirical Methods in Software Engineering
3	2AMD15	Big Data Management
3	2IMN30	Machine Learning for Industry
4	2IMP20	Domain Specific Language Design
4	2IMP30	System Design Engineering